Well-Defined Silica-Supported Nickel Surface Sites for the Direct Conversion of Ethylene to Propylene

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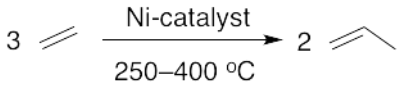
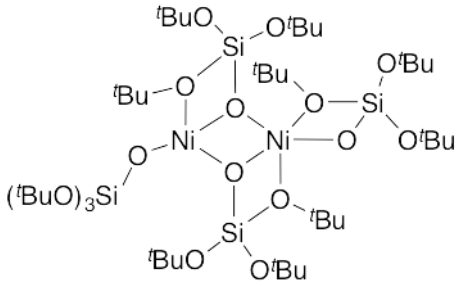
Ni-modified mesoporous MCM-41 catalyzes the direct transformation of ethylene to propylene, the so-called ETP reaction, with conversion up to 68 % and propene selectivity up to 48 % [1]. Incorporation of aluminum into Ni-MCM-41 increases the catalytic activity [2], however, the role of aluminum, the reaction mechanism and nature of the active sites remains unknown [3].

Scheme 1. Ni-based catalysts for ETP reaction

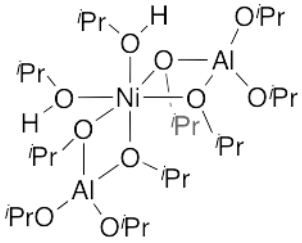


Literature Ni-catalysts: Ni-MCM-41 [1], Ni-(Al)MCM-41 [2]

This work: **1**/SiO_2 , **1**/MCM-41, **1**/(Al)MCM-41, **2**/MCM-41 (after calcination in synth. air)



(1)



(2)

Here, using a combination of surface organometallic chemistry and thermolytic precursor approach [4], we synthesized well-defined Ni(II) surface sites on silica-based supports (MCM-41 and Al-MCM-41) exploiting nickel siloxide (**1**) and aluminate (**2**, Scheme 1) molecular precursors. Their structure and reactivity towards ethylene will be discussed.

[1] M. Iwamoto, Y. Kosugi, *J. Phys. Chem. C,* **2007**, 111, 13.
[2] L. Alvarado Perea, T. Wolff, P. Veit, L. Hilfert, F.T. Edelmann, C. Hamel, A. Seidel-Morgenstern, *J. Catal.,* **2013**, 305, 154.
[3] a) M. Iwamoto, *Catal. Surv. Asia,* **2008**, 12, 28. b) M. Iwamoto, *Molecules,* **2011**, 16, 7844. c) M. Iwamoto, *Catal. Today,* **2015**, 242, 243.
[4] C. Copéret *et al. Chem. Rev.,* **2016**, 116, 323.